



SOUTHERN CALIFORNIA
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Delivering Cost-Effective Demand Response: A Portfolio Approach

presented by:

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PLMA Fall Conference
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Agenda

- Background – The “Vision” for Demand Response (DR)
- Building the Portfolio – SCE’s Plan for Achieving Results
- Infrastructure Support
- New DR Initiatives/Feedback
- Next Steps: Evaluation of Advanced Metering Business Case
- Providing DR Value
- The Advanced Load Control Solution
- The Bottom line

The Market For DR In California Today

- Stable Prices Today, But....
 - Transmission Constrained
 - Limited Investment in New Generation
 - No “transparent” prices (maybe in '06?)
 - Record Setting Peaks This Year (SCE - 20,762 MW; CA - 45,597 MW)
 - 3 Curtailment Events This Year
- New Resource Adequacy Rules Expected to Limit Volatility in the Market (Pending)
 - New Reserve Requirements
 - Significant Procurement Of Resources In Advance

“The Vision”- Demand Response Goals

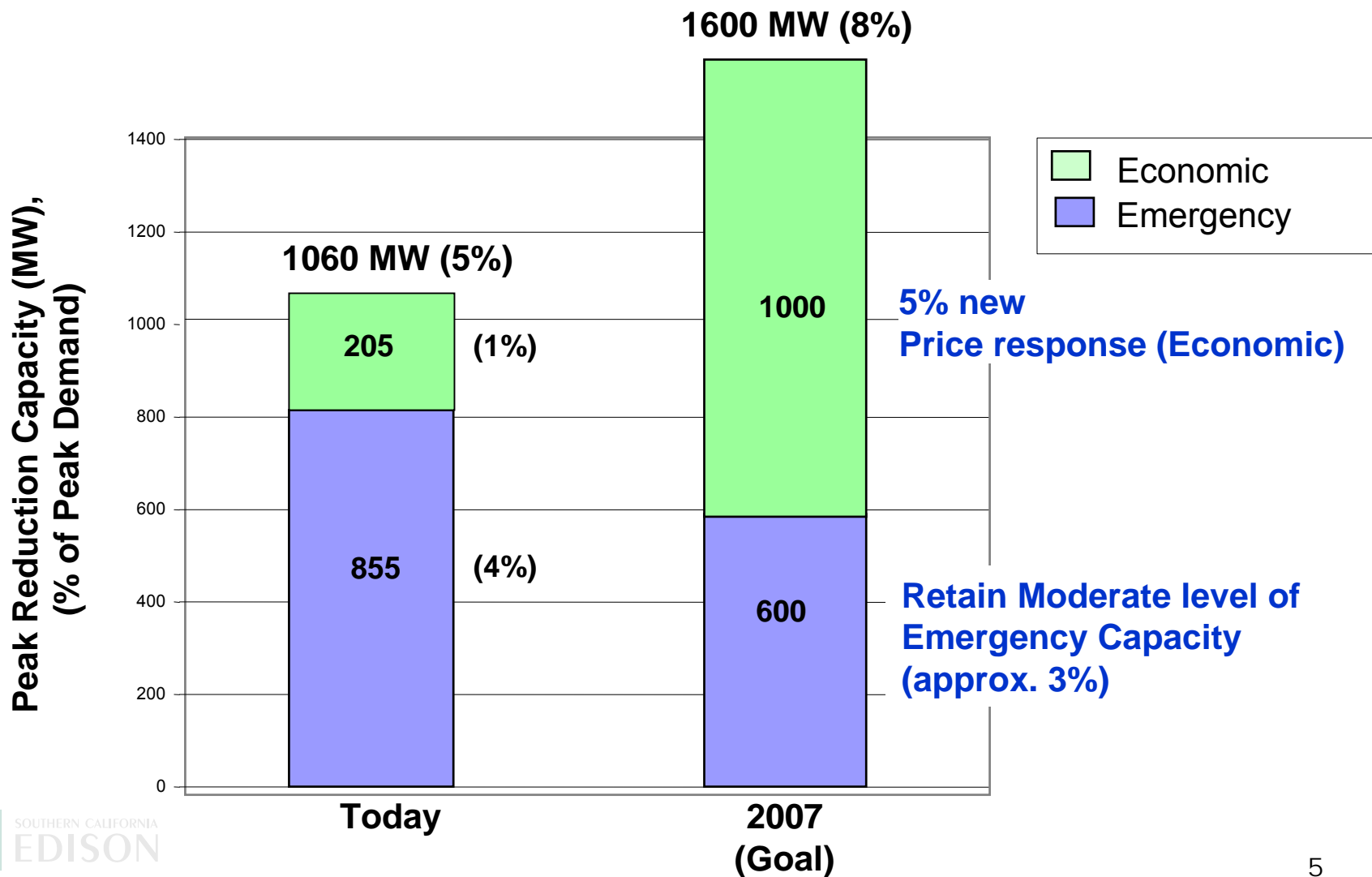
- From CPUC Decision 03-06-032, dated June 5, 2003 *

□ 2003	150 MW
□ 2004	141 (revised from 400 MW)
□ 2005	3% of Annual System Demand
□ 2006	4% of Annual System Demand
□ 2007	5% of Annual System Demand <i>(equates to about 1000 MW)</i>

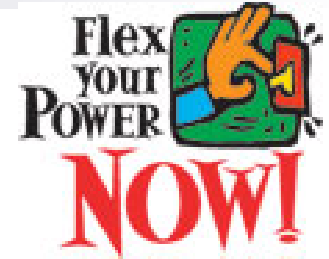
*** Note: Excludes Demand Response From Existing
Emergency Programs**

- UDC's ordered to include targets in procurement plans

DR Today vs. 2007 Goals



SCE's Plan for Achieving Goals



- Build robust portfolio of programs to include **all** customers and **all** demand response capability (i.e. economic and emergency)
- Expand residential air conditioning load control program
 - Integrate advanced load control technology (i.e. smart thermostats) with existing infrastructure
 - Include an economic trigger
- Support implementation/rollout of dynamic price response where proven feasible and cost-effective
- Implement statewide customer awareness and education campaign

DR Program Design: A Balancing Act

	Customer	Planner/Administrator
Complementary Objectives	<ul style="list-style-type: none">■ No interruptions■ Real time visibility■ Simple to understand	<ul style="list-style-type: none">■ 100% reliability (insurance)■ Real time “verifiable” load*■ Simple to administer
Competing Objectives	<ul style="list-style-type: none">■ High Incentive (stable price)■ 24-48 hours notice■ No risk (no penalty)■ Customer-specific baseline■ Long-Term Contract	<ul style="list-style-type: none">■ Minimize costs (market price)■ Immediate dispatch*■ Dependable load commitment■ Uniform baseline methodology■ Flexibility to respond to market

Key Messages: * Price drivers = dependable (firm) load, immediate dispatch

Building the DR Portfolio

Description*	Incentive Structure (Mandatory or Voluntary)	Resource Value	Customer Profile
Capacity (or Reservation)	Higher incentives, stringent performance obligation (mandatory)	Firm – high value (Emergency)	High risk, high reward. Ability to curtail load with little notice (30 minutes or less)
Energy (bidding, pre-scheduled)	Lower incentives; modest or small penalties, “Pay for performance” (voluntary)	Non-firm – lower value (Economic)	Low risk, modest reward. Ability to curtail/shift load with advance notice (DA)
Load control (automated response)	Customer chooses technology enabled response; up front credit (voluntary)	Firm – high value (Emergency & Economic)	Customer choice up front; good for discretionary loads (eg. a/c)
Time Varying Rates <i>* Programs can be combined</i>	TOU, CPP, RTP (e.g. market based price signal and/or super peak charge) (voluntary)	Non-Firm – lower value (Economic)	Modest risk; customer chooses to respond during event (or pay premium charge)

SCE DR Portfolio Today

PROGRAM	Year	FEATURES							ELIGIBILITY					MARKET	
		Guaranteed Payment/Discount	Pay for Performance	Limited Number of Events	Minimum Load Reduction	Interval Metering Req.	Advance Notice	Penalty/Peak Charge	Residential	Comm. (<200 kW)	Comm. (>200 kW)	Ind. (>500 kW)	Agricultural and Pumping	Direct Access	Utility Service
Agricultural and Pumping Interruptible	'87	●		●	●			Yes					●	●	●
Air Conditioner Cycling Program – Base	'83	●		●				No	●	●	●	●		●	●
Air Conditioner Cycling Program – Enhanced	'01	●						No	●	●	●	●		●	●
Base Interruptible Program	'01	●		●	●	●		Yes				●		●	●
Large Power Interruptible	'79	●		●	●	●		Yes				●		●	●
Optional Binding Mandatory Curtailment	'01				●	●		Yes		●	●	●		●	●
Scheduled Load Reduction Program	'01		●	●	●	●	●	No		●	●	●	●		●
SCE Energy \$mart Thermostat sm (pilot)	'03	●		●	●	●		Yes		●	●	●		●	
Demand Bidding Program	'03		●		●	●	●	No			●	●	●		●
California Power Authority Demand Reserves Program	'03	●	●	●	●	●	●	Yes		●	●	●	●	●	●
Critical Peak Pricing (residential – pilot)	'03	●		●		●	●	Yes	●		●	●	●		●

SCE Peak Reduction Capacity – July '04

PROGRAMS	Service Accounts	Available Power Reduction (MW)	Estimated Peak Response (MW)	Avg. \$\$ Saved Customer/Year
Air Conditioner Cycling Program – Base	89,841	205	164	\$110
Air Conditioner Cycling Program – Enhanced	24,495	50	40	\$220
Agricultural & Pumping Interruptible	350	58	58	\$3,200
Base Interruptible	63	73	58	\$82,000
Large Power Interruptible Programs	512	642	514	\$115,000
Optional Binding Mandatory Curtailment	13	28	8	exempt from rotating outage
Scheduled Load Reduction Program	15	4	4	\$700
Energy Smart Thermostat Program	2,342	17	9	\$150
California Power Authority Demand Reserves Program	73	117	117	N/A
Critical Peak Pricing Program	8	1	<1	N/A
Demand Bidding Program	514	87	87	N/A
Total	118,226	1,282	1,060	

DR Portfolio Support Requirements

Program/Ops

- 13 Programs (3-Pre '98)
- About 1000 MW Peak Response (1500 MW in year 2000)
- 70 Curtailment Events (Almost 300 hours)
 - Pre-1998 - 4
 - 1999 - 1
 - 2000 - **21**
 - 2001 - **38**
 - 2002 - 3
 - 2003 - 2
 - 2004 - 3
- Over 1 million pages and e-mails
- Over 100,000 compliance bills
- Over 1 million mailings annually
- Communications in 5 languages

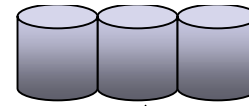
Infrastructure

- Over 250,000 Load Control Switches installed since '83 (1-way)
- 12,000 Real Time Meters
- 9,000 Smart Thermostats (2 Way)
- 21 VHF Transmitters
- 2 Secure Websites (Internet)
- 3 Auto Dialers (>500 lines)
- Real Time Load Display (Firewall Protected)
- 1200 Load Monitoring/Alert Devices (Large Power)
- Satellite Paging

SCE Demand Response Capability — Infrastructure

CUSTOMER DATABASES

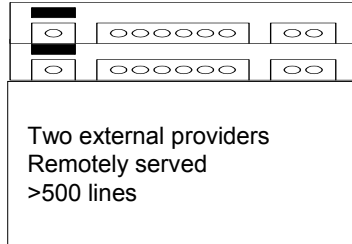
Customer/Program Info
Equipment/ Maint.
Reporting / Billing



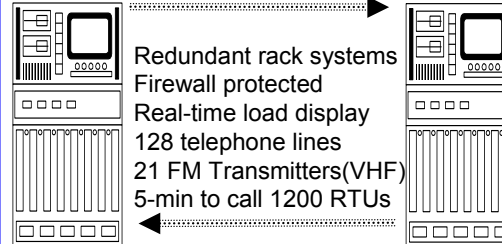
MULTIPLE CONTROL PLATFORMS

Event Launching
Bidding Platform
Notification Platform
Load Verification

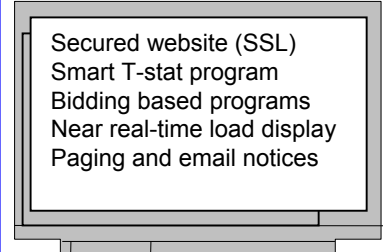
AUTO DIALERS



GRID DISPATCH

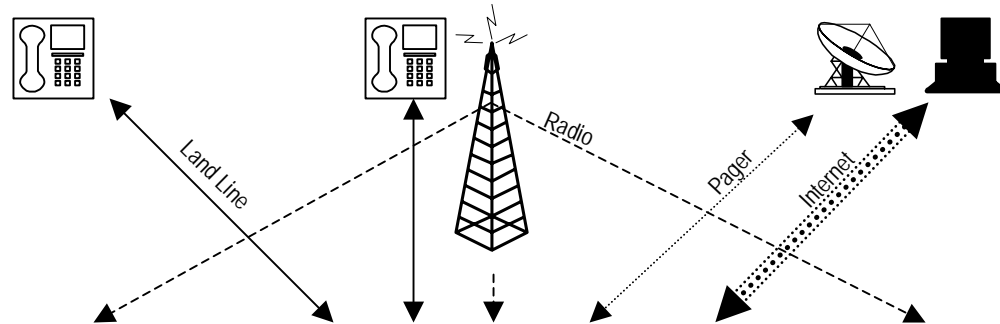


INTERNET



MULTIPLE COMMUNICATION PROTOCOLS

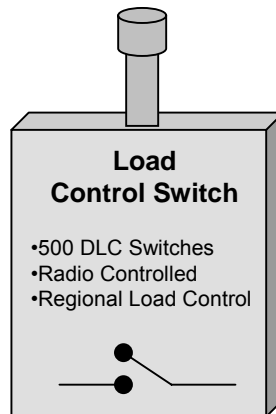
FM Radio
Pager /
Satellite
Internet
Telephone



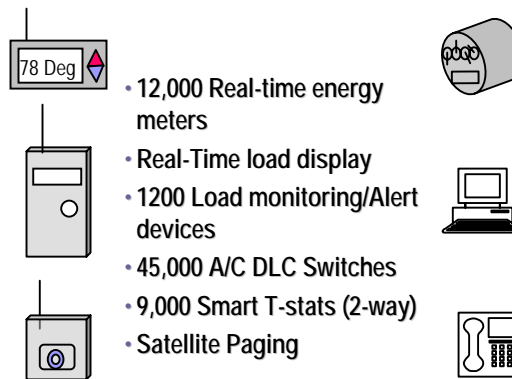
END-USER DEVICES AND INTERFACE

Remote Terminal Units
Load Control Switches
Smart T-stat
RTEM Meters
Internet Applications

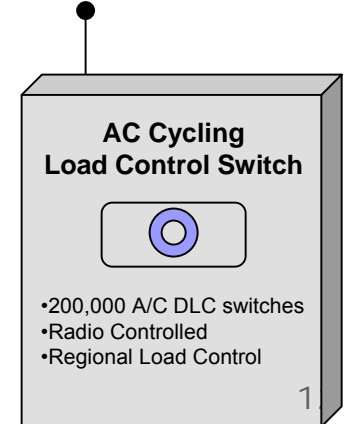
AG & PUMPING



COMMERCIAL / INDUSTRIAL



RESIDENTIAL

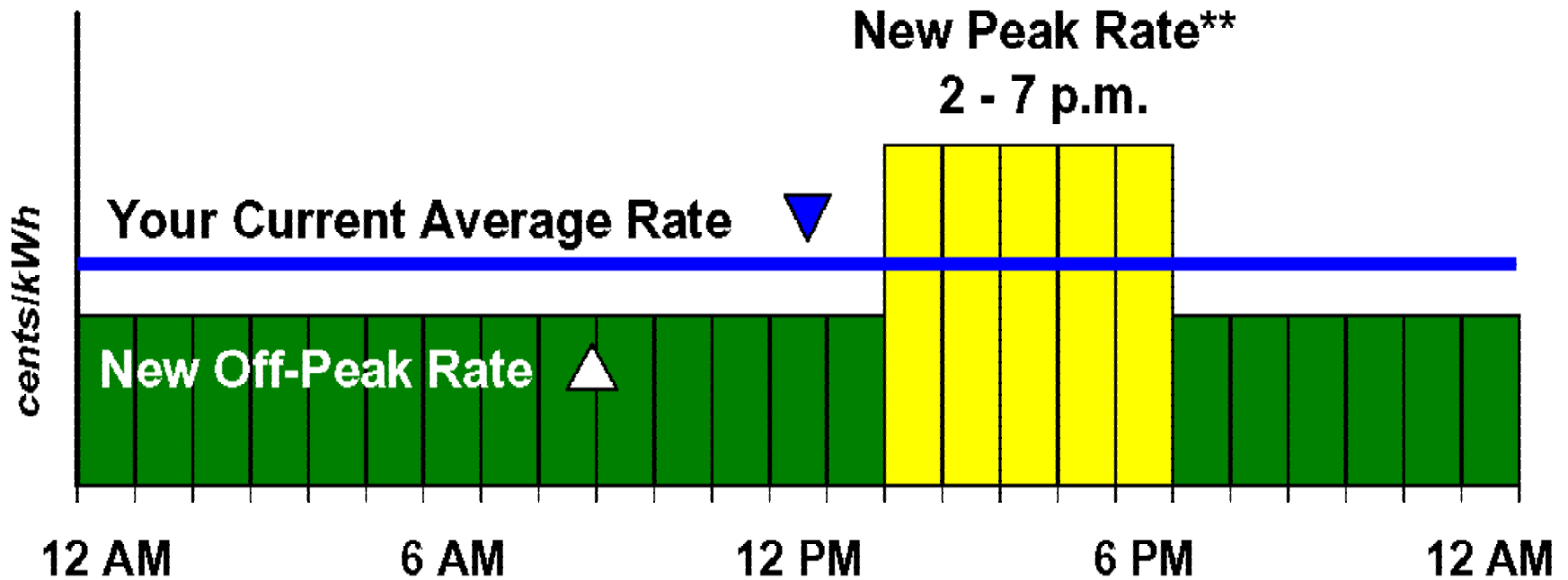


“New” California DR Initiatives



- CPUC Proceeding launched in Summer '02 to promote DR as a resource to mitigate procurement costs and enhance reliability
 - **Phase 1 for small customers (<200 kW)** authorized 18 month pilot for 2500 customers of critical peak/TOU pricing to provide demand response input for analysis of deployment of advanced meters in Phase 2 (Approved March 14, 2003).
 - **Phase 1 for large customers (>200 kW)** adopted new Critical Peak Pricing and Demand Bidding Programs (including dispatch of CA Power Authority Programs) (Approved June 5, 2003). Consideration of RTP pricing pending.
 - **Phase 2 (pending)** to address cost-effectiveness of advanced meter deployment based on demand response results developed in Phase 1.

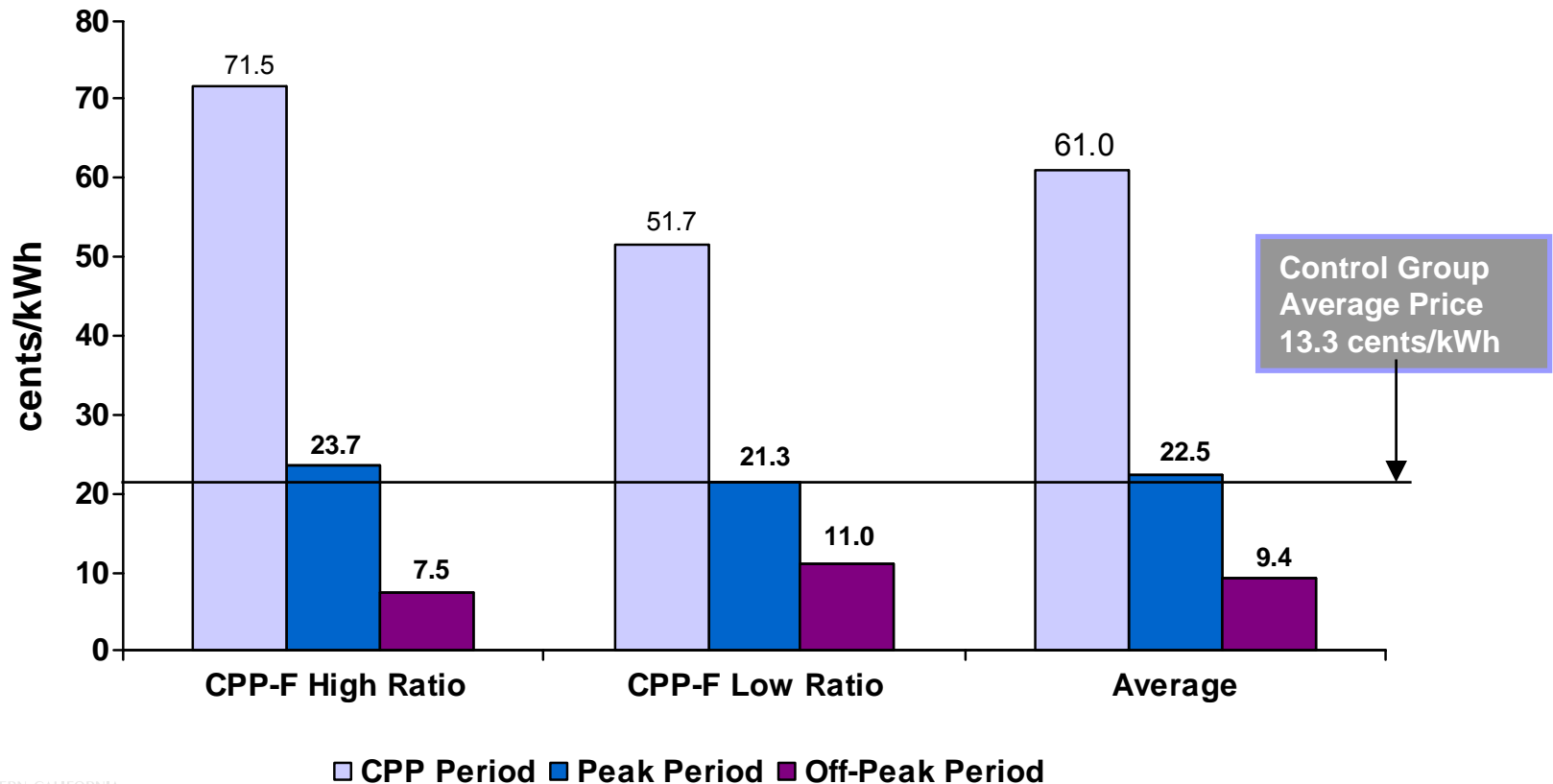
Illustrative CPP Rate Design



**** Applicable up to 15 days per year (Monday – Friday)**

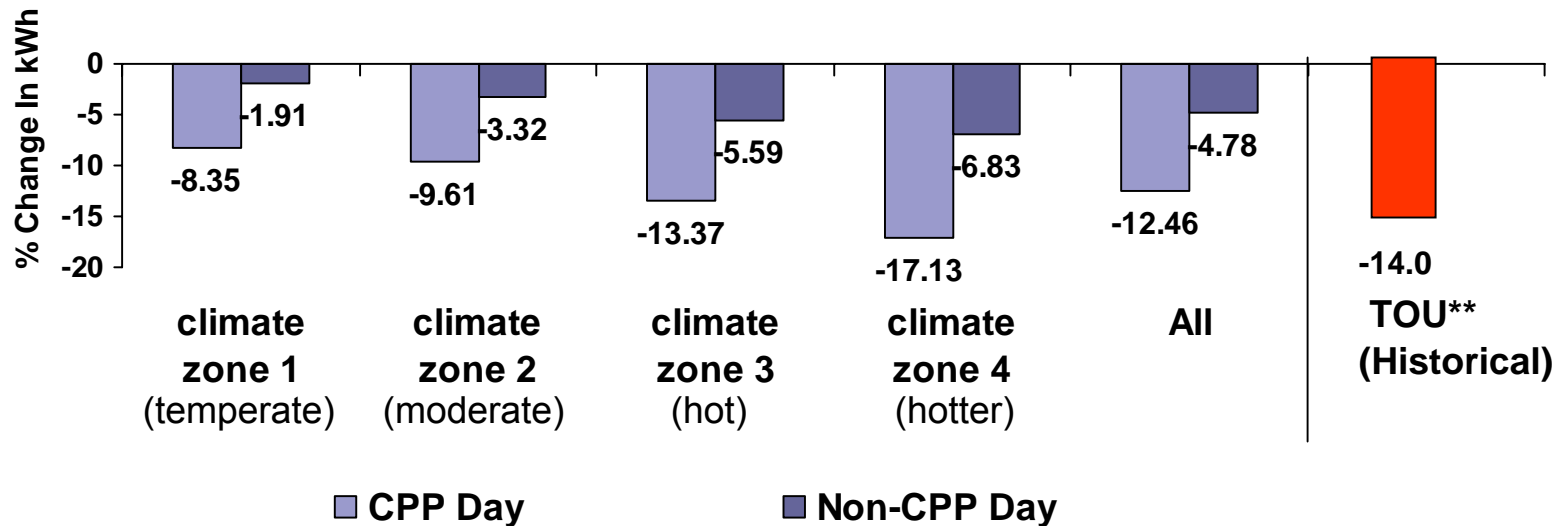
Small Customer CPP Pilot Rates

Rates were varied by customer groups for purposes of estimating demand function (illustrative)



Small Customer CPP results (8/9/04 report)

Percent Change In Peak Energy Use Over Time Period - (Summer '03 Analysis)*



* CPP impacts do not include enabling technology – average load reduction increases by over 2x with enabling technology (i.e. a/c load control)

** TOU rates were tested but did not yield statistically valid results. For comparison purposes, TOU estimate reflects the results of prior studies validated by EPRI

Large Customer Demand Bidding

- **Applicable to utility service customers only (Direct Access Customer participation pending)**
 - Minimum bid of 100 kW per hour.
 - Demand reduction must be within +/- 50% (payments based on actual load reduced)
- **Price trigger**
 - IOUs to forecast hourly price offer on day-ahead basis
 - DBP is triggered when price = or > \$.15 per kWh
- **Reliability trigger**
 - DBP triggered by ISO on day of basis
 - Incentive paid = \$.50 per kWh x kWh reduction

Demand Bidding Internet Notifications and Customer Interface

User Notice - Microsoft Internet Explorer provided by Edison International

Address: https://65.203.51.164/siliconenergy/curtailment/asp/user_notice.asp

User Notice

Current server time: 9/13/2002 4:51 PM
Pending curtailment notices: (4)

1 Select facility
3-111-1111-11 kW/KWh

2 Select notice
9/13/2002 6:00:00 PM ** Demand Bidding Day Of
Type: Voluntary
Starts: 9/13/2002 6:00 PM PDT
Ends: 9/13/2002 10:00 PM PDT
Respond by: 9/13/2002 5:00 PM PDT

3 Enter reductions
Enter reductions greater than or equal to: 100 kW

Block	Starts	Ends	\$/MWh	kW reduction
1	18:00	19:00	350.00	100
2	19:00	20:00	350.00	100
3	20:00	21:00	350.00	100
4	21:00	22:00	350.00	100

Target compensation: \$ 140

4 Respond
Accept Decline

Facility load levels
View: Event hours only

Overlay actuals:
 Today
 Yesterday
 Same day last week

Customer Reviews Curtailment Event

1. Receives pager/email notice
2. Reviews event hours and incentive amount
3. Places load curtailment bid

Microsoft Internet Explorer provided by Edison International

Address: 1.164/siliconenergy/curtailment/asp/user_monitor.asp

User Monitoring

Current server time: 9/13/2002 4:54 PM

1 Select facility
3-111-1111-11 kW/KWh

2 Select event
2562 ** 9/13/2002 6:00:00 PM ** Demand Bidding
Event ID: 2562
Starts: 9/13/2002 6:00 PM PDT
Ends: 9/13/2002 10:00 PM PDT
Time left: 04:00

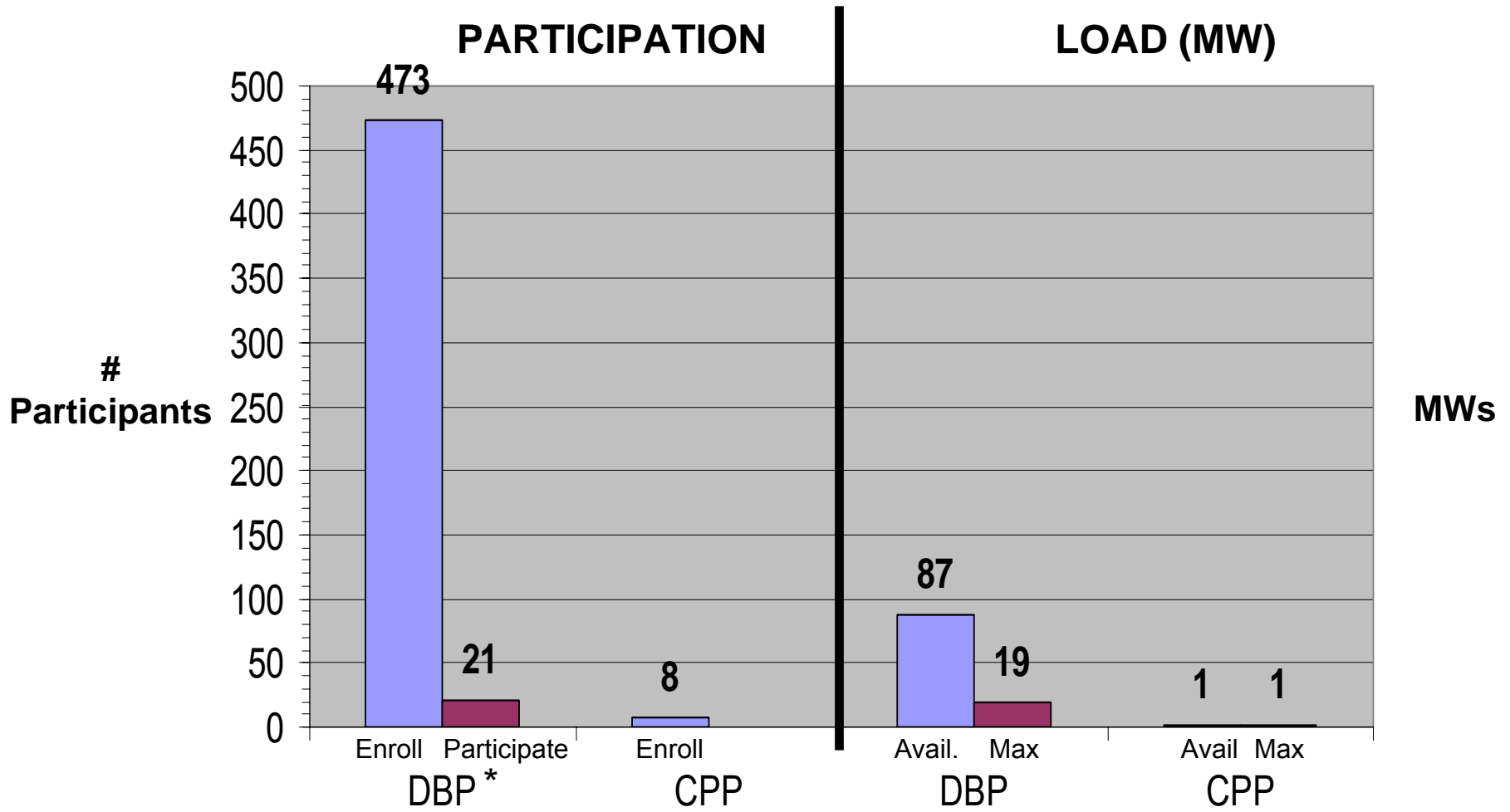
3 View facility's performance
Current load: n/a
Target load: 200 kW
Current reduction: n/a
Committed reduction: 0 kW
Average reduction: n/a
Current price: 0.00 \$/MWh

Event performance
View: Event hours only

Customer Monitors Performance

1. Baseline Load
2. Target Load
3. Actual Load

CPP / DBP Results to Date



* Test 2 (Largest number of signups)

* CPP Peak Performance across 4 events

Initial Assessment of New DR Programs

- Evidence to support that policy/program changes are necessary to achieve price response goals
- **Large Customer Rollout (CPP/DBP) (Phase 1)**
 - Successful Rollout and Marketing (i.e. high customer awareness) but limited growth in peak reduction capacity
 - Most customers interested in voluntary (no penalty) DBP
 - Inability to shift load is #1 reason for minimal/non-participation (most customers claim they have already shifted)
- **Small Customer Pilot (CPP) (Phase 1)**
 - Currently in 2cd summer of 18 month pilot
 - Updated Summer '03 results (Aug. 9, 2004) show price response however lingering issues as to magnitude, persistence and validity
 - Most significant response achieved with enabling technology
 - Consumer issues: Market research shows mixed response to CPP or “dynamic pricing”

New Innovations In Testing: “The Orb”



The “orb” changes **color** based on price

What is the impact of...

- Automated control of multiple loads
- Enhanced information
 - User friendly web design with actionable information
- Improved notification
 - Testing effectiveness of visual notification signals (i.e. “the orb”)

“SCE is continuously seeking new and innovative ways to deliver cost-effective DR”

Now What? Phase 2 – AMI Issues

- Utilities preparing business case analyses for deployment of advanced metering infrastructure (AMI) to support dynamic pricing to be filed on Oct. 15, 2004
- **Threshold Question: Do operational benefits of AMI (with demand response) outweigh costs?**
- Critical Issues:
 - How do we recruit over 4 million customers? (Mandatory vs. Voluntary)
 - Will customers accept dynamic pricing? If we build it, will they play? How long will they play? Do we need to change “the law” ?
 - What is the rate impact? What is the cost recovery risk?
 - Is the technology proven? What is the risk of obsolescence? What is the standard? Will customers use the data? Who owns the meters?
 - Who pays stranded costs? What if the benefits don't materialize?
 - What is a feasible implementation period? 5 years?
 - What is the right value to be used for potential capacity and energy benefits from AMI? Can we count on it? Does it meet resource adequacy rules? Will it persist?
 - **Is AMI the most cost-effective solution to achieve DR goals?**

Maximizing DR Resource Value

LOW

HIGH



- Non-Firm
- Advance Notice (Day Ahead)
- Limited Operating History
- Voluntary – Pay for Performance (No Penalty)
- Firm (Dependable)
- UDC Dispatch (<10 minutes)
- Real Time Visibility or Statistical Validation
- Mandatory – Guaranteed Payment (Significant Penalty for Non-Performance)

Maximizing Value Thru Advanced Load Control

- Highest value load – can be dispatched in 10 minutes
- Proven load reduction capacity (based on SCE and other UDC experience)
- Utilizes smart thermostats (temperature adjustment is easier to understand vs. cycling)
- Untapped market potential (only 5% residential saturation today; forecast to reach 25% over 7 years)
- Leverages existing infrastructure and labor
- Low acquisition cost for residential customers @ less than \$300/kw (equipment plus installation)
- Can be regionally marketed & dispatched for distribution relief
- Demand impact easily validated through statistical sampling
- Residential ALC can yield 700 MW by 2011 (7 years)



Summary of Advance Load Control Plan

Today (a/c cycling) (2 programs)

- 104,000 Domestic
- 175 MW of curtailable load
- Emergency Trigger
- Rarely dispatched (6 hr maximum)

Base available 15 x 6hrs = 90hrs
Enhanced=unlimited

- Premise device is RF remote control switch on a/c
- Program provides CT capacity resource equivalent

Future (Advanced Load Control) - (1 program)

- 500,000 customers (over 7 years)
- 700 MW of curtailable load plus energy
- Economic & Emergency
- Dispatched 70 hrs/yr (4 hour max)

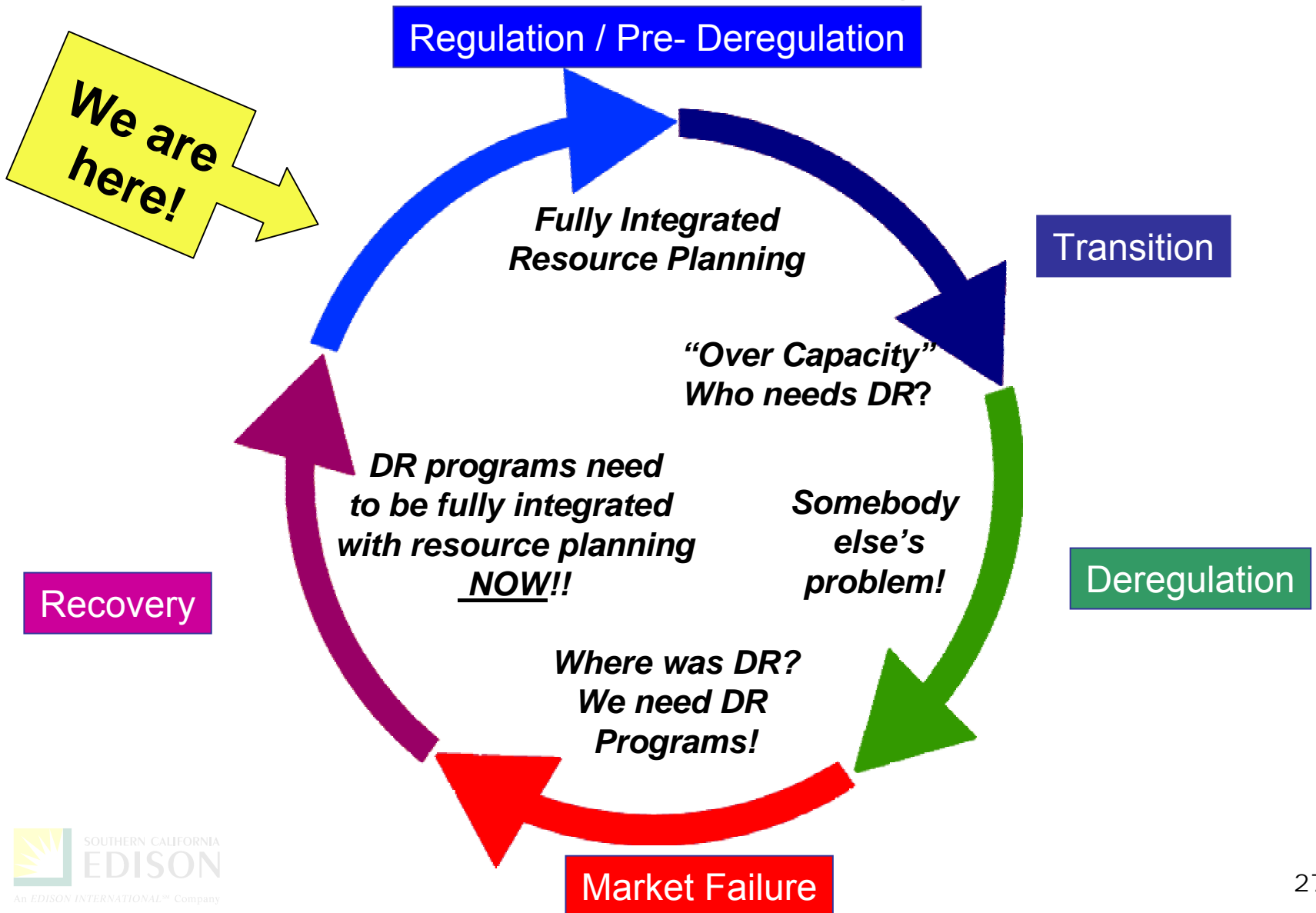
Emergency - 20 hrs
Economic - 50 hrs

- Premise device is smart T-stat and communications module (for multiple loads) or load control switch on a/c unit
- Provides CT capacity resource equivalent plus; plus EE benefits

ALC Can Co-Exist with Dynamic Pricing

- CPUC vision specifies that customers should be able to choose “voluntarily” among 3 basic tariff options: CPP, TOU, and flat rates (w/ hedge)
 - Customers choosing TOU or flat rate can be offered ALC option
 - Existing ALC customers should be offered “choice” of new CPP option or retaining ALC with flat or TOU rate choice
- ALC “enables” load reduction under all tariff options or combinations of options
- Future technology options could involve load control embedded in meters and appliances

The DR Resource Planning Continuum



The Bottom Line:

- Programs must provide a balance between both resource planning and customer needs.
- DR Resources must be cost-effective when compared to supply alternatives
- New programs will require time to demonstrate reliable response.
- Build on the infrastructure that works today (e.g expand advanced load control capability).
- DR isn't REAL until it becomes a dependable resource fully integrated into short and long term resource plans.

Helpful Websites

- Southern California Edison – Demand Response Programs
 - www.sce.com, *Demand Response Programs*
 - www.sce.com/drp, or